National Institute of Environmental Health Sciences

Sensitivities of ozone and fine particulate matter formation to emissions under the impact of potential future climate change

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Abstract:

Impact of climate change alone and in combination with currently planned emission control strategies are investigated to quantify effectiveness in decreasing regional ozone and PM2.5 over the continental U.S. using MM5, SMOKE, and CMAQ with DDM-3D. Sensitivities of ozone and PM2.5 formation to precursor emissions are found to change only slightly in response to climate change. In many cases, mass per ton sensitivities to NO(x) and SO2 controls are predicted to be greater in the future due to both the lower emissions as well as climate, suggesting that current control strategies based on reducing such emissions will continue to be effective in decreasing ground-level ozone and PM2.5 concentrations. SO2 emission controls are predicted to be most beneficial for decreasing summertime PM2.5 levels, whereas controls of NO(x) emissions are effective in winter. Spatial distributions of sensitivities are also found to be only slightly affected assuming no changes in land-use. Contributions of biogenic VOC emissions to PM2.5 formation are simulated to be more important in the future because of higher temperatures, higher biogenic emissions, and lower anthropogenic NO(x) and SO2 emissions.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: SRES A1B

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

Air Pollution: Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

Air Pollution (other): NOx;SO2;VOC

Temperature: Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Medium-Term (10-50 years)